 Integration

Resources

[AMSI website](http://www.amsi.org.au/ESA_Senior_Years/SeniorTopic3/3_md/SeniorTopic3f.html) – Supporting Australian Mathematics Project (A guide for teachers of year 11 and 12) has a good comprehensive overview of Integration [Dynamic calculus](https://schoolsequella.det.nsw.edu.au/items/07c79e99-fecb-4621-ba0e-ffa8524bb0aa/1/)

This resource combines a collection of Geogebra interactive learning objects with material explaining the significance and history of calculus, including the 'calculus controversy'. Note – needs java.

| Content | Teaching strategies and activities | Resources |
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| The definite integral. | [Explore finding approximations of areas under the curve](http://archives.math.utk.edu/visual.calculus/4/areas.4/) through computer animations and applets  Also explore the notation of Summation used to add the infinitesimally small rectangles to gain an approximation and how this notation evolved into the integral sign now used. | [Animations and tutorials on integration](http://archives.math.utk.edu/visual.calculus/4/index.html)  [Geogebra File (Area under Curve)](https://drive.google.com/a/education.nsw.gov.au/file/d/0B9hzfac53d3tbF9wSXpFcEFOLUk/view?usp=sharing)  [YouTube tutorial for making your own Geogebra file](https://youtu.be/3GcHkG_vewI) |
| The relation between the integral and the primitive function. | The area under the graph should be explored as having an upper and lower bound as c approaches x (a full description can be found in the syllabus).  Both definite and indefinite integrals should be practiced.  The concept that the integral of a function between b and a is equivalent to the area under the curve between these two points needs to be explored in a variety of examples (which may include the later topics of exponential and log integration and trigonometric integration) as there have been a number of HSC questions that ask students to interpret graphs geometrically rather than analytically. | [Catchy song that explains the fundamental theorem of calculus](https://youtu.be/gMdh_fiGZag)  [Integrals Cheat Sheet](http://tutorial.math.lamar.edu/pdf/Calculus_Cheat_Sheet_Integrals.pdf) |
| Approximate methods: trapezoidal rule and Simpson’s rule. | Approximate methods, trapezoidal rule and Simpson’s rule should be explored as a way of:   * Finding the approximate area under a curve when the function is not easily integrated. * Finding areas and volumes where a set of values are given for measurements at equal intervals along a length.   Trapezoidal Rule    Simpson’s Rule    Students should have a way of easily remembering the 2 formulas and a strategy for use of these formula for multiple subintervals. Thought should be given to whether it is easier to do 2 or 3 applications of the rule or to commit to memory the multiple applications versions of the rules. Students should be shown both ways.  From the syllabus – “Examples should be confined to problems in which the resulting calculations are easily performed on a calculator, but should include functions whose integrals are discussed or occur later in this syllabus when examples involving them may appropriately be introduced.” | [Trapezoidal rule YouTube video](https://www.youtube.com/watch?v=JGeCLfLaKMw)  [Simpson’s rule YouTube video](https://www.youtube.com/watch?v=z_AdoS-ab2w)  Note – these 2 videos use a graphics calculator to find function values |
| Applications of integration: areas and volumes of solids of revolution. | Areas:  Problems involving areas bounded by the x- axis, y-axis and areas between 2 curves should be investigated. Students should be always do a sketch of the problem to help them work out which integral will solve the problem.  Volumes:  Only the disk method is used for volumes of solids of revolution in the Mathematics (2U) course.  Volumes could be made by revolving the function round either the x or the y axis.  Students should have a method they work through to build up the interval rather than simply rote learning each type of problem as questions may be of the form “Describe, explain etc.”  The volume of a cone and a sphere should be derived  This section of integration should revisited using exponential, logarithmic and trigonometric functions after they are covered in the course. | [Volumes of solids of revolution YouTube video](https://youtu.be/1CbZlM09zF8)  Past HSC questions  2012 Q10 |